PATENT COOPERATION TREATY

From the INTERNATIONAL BUREAU

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

Date of mailing (day/month/year) 23 November 2000 (23.11.00)	
International application No. PCT/EP00/03745	**Applicant's or agent's file reference** C807.1/S
International filing date (day/month/year) 21 April 2000 (21.04.00)	**Priority date** (day/month/year) 27 April 1999 (27.04.99)
Applicant MATVEEV, Boris et al	

1. The designated Office is hereby notified of its election made:

[X] in the demand filed with the International Preliminary Examining Authority on:

19 October 2000 (19.10.00)

[ ] in a notice effecting later election filed with the International Bureau on:

2. The election [X] was

[ ] was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO **34, chemin des Colombettes** **1211 Geneva 20, Switzerland**	Authorized officer Charlotte ENGER
Facsimile No.: (41-22) 740.14.35	Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

14

Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
C807.1/S		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP00/03745	21/04/2000	27/04/1999
International Patent Classification (IPC) or national classification and IPC H01L33/00		
Applicant SERVICES PETROLIERS SCHLUMBERGER		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

   ☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations suporting such statement
   - VI ☐ Certain documents cited
   - VII ☒ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
19/10/2000	20.07.2001
Name and mailing address of the international preliminary examining authority: European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Krause, J Telephone No. +49 89 2399 2829

Form PCT/IPEA/409 (cover sheet) (January 1994)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP00/03745

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:
Description, pages:

1-18 as originally filed

Claims, No.:

1-21 as originally filed

Drawings, No.:

1-4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:
see separate sheet

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	2 - 6, 8, 10, 12, 14 - 21
	No:	Claims	1, 7, 9, 11, 13
Inventive step (IS)	Yes:	Claims	2 - 5, 12, 14 - 21
	No:	Claims	1, 6 - 11, 13
Industrial applicability (IA)	Yes:	Claims	1 - 21
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

Concerning Section I:

1. There are two claims No. 14, while claim 15 is missing. For the following preliminary examination, the second claim 14 is considered as claim 15.

Concerning Section V:

I. Claim 1:

1. The document Patent Abstracts of Japan, vol. 15, No. 412 (E-1124);& JP-A-3 171 791 (= D1) describes a radiation source comprising a first active layer (14) coupled to a second active layer (15), wherein the first active layer (14) produces primary radiation of frequency v_1 corresponding to a wavelength λ_1=0.98μm by appropriate stimulation, and the primary radiation is converted by the second active layer to secondary radiation of frequency v_2 corresponding to a wavelength λ_2=1.54μm for subsequent output.

2. As a consequence, all the features of claim 1 are anticipated by document D1. Claim 1 is therefore not considered to meet the requirements of Article 33(2) and (3) PCT.

II. Claims 2 to 21:

1. The document US-A-4 142 196 (= D2) describes an assembly of light emitting diodes, which are formed by diffusion of islands into a stack of epitaxial semiconductor layers. In this device, however, the light generated in a lower layer is not absorbed by any upper layer, and therefore the idea of using more than two active layers cannot be transferred from document D2 to document D1 without inventive activity. As a consequence, claim 2 is considered to meet the requirements of Article 33(2) and (3) PCT

2. The device according to document D1 does not comprise an intermediate coupling layer, since the first and second active layers are disposed adjacent to each other to provide the effect of a diffraction grating. Therefore the person skilled in the art would not contemplate to use an intermediate layer. Claims 3 to 5 are considered to meet the requirements of Article 33(2) and (3) PCT, accordingly.

3. According to document D1 the active layers are not doped. In document D2 the epitaxial layers comprise p-n-junctions. Generally the person skilled in the art of semiconductor light emitting devices knows doped active layers and he knows also active layers comprising a p-n-junction therein. It would therefore not require any inventive thought to dope the active layers in the device according to document D1, so that a p-n-junction is formed in the first active layer, if this is appropriate due to the properties of the materials employed. Thus claim 6 is not considered to meet the requirement of Article 33(3) PCT.

4. Since first active layer of the device according to document D1 emits radiation at all, there must be an injection region incorporated in this first active layer, where injection of electrical carriers into the first active layer from the injection region stimulates the first active layer to emit the primary radiation. As a consequence, claim 7 is not considered to meet the requirements of Article 33(2) and (3) PCT.

5. Claim 8 is not considered to meet the requirement of Article 33(3) PCT for the reasons set out in paragraph 3 above in connection with claim 6.

6. Since in the device according to document D1 converts primary radiation to a secondary radiation having a much larger wavelength, the conditions of claim 9 are obviously fulfilled in the device according to document D1. Therefore claim 9 is not considered to meet the requirements of Article 33(2) and (3) PCT.

7. The conditions specified in claim 10 are necessary to obtain secondary radiation with a substantial intensity. The person skilled in the art would attempt to ensure these conditions in a device according to document D1 as well. Therefore claim 10 is not considered to meet the requirement of Article 33(3) PCT.

8. The additional features of claims 11 and 13 are known from document D1, because

w=0 is not excluded in claim 13. Thus claims 11 and 13 are not considered to meet the requirements of Article 33(2) and (3) PCT.

9. The employment of a III-V compound semiconductor without Ga in an active layer is not known from document D1. Claim 12 is therefore considered to meet the requirements of Article 33(2) and (3) PCT.

10. The additional features of claims 14 and 15 are not known from document D1 or any other document cited in the search report. Claims 14 and 15 are therefore considered to meet the requirements of Article 33(2) and (3) PCT. Claims 16 and 17, which depend on claims 14 and 15, are considered to meet these requirements as well.

11. The radiation source according to document D1 is a semiconductor laser having a periodical gain variation. The person skilled in the art would not transfer this concept to a light emitting diode without any inventive thought, and therefore claim 18 is considered to meet the requirements of Article 33(2) and (3) PCT.

12. The additional features of claims 19 to 21 are not known nor rendered obvious from the available prior art. Thus claims 19 to 21 are considered to meet the requirements of Article 33(2) and (3) PCT as well.

Concerning Section VII:

1. Independent claims 1 is not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art (document D1) being placed in the preamble (Rule 6.3(b)(i) PCT) and with the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).

2. The features of the claims are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT).

3. Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in the document D1 is not mentioned in the description, nor is this document identified therein.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference	**FOR FURTHER ACTION**	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
C807.1/S		
International application No.	International filing date *(day/month/year)*	(Earliest) Priority Date *(day/month/year)*
PCT/EP 00/ 03745	21/04/2000	27/04/1999
Applicant		
SERVICES PETROLIERS SCHLUMBERGER		

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 4 sheets.

[X] It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

   a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

   [ ] the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

   b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing :

   [ ] contained in the international application in written form.

   [ ] filed together with the international application in computer readable form.

   [ ] furnished subsequently to this Authority in written form.

   [ ] furnished subsequently to this Authority in computer readble form.

   [ ] the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

   [ ] the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. [ ] **Certain claims were found unsearchable** (See Box I).

3. [ ] **Unity of invention is lacking** (see Box II).

4. With regard to the **title,**

   [X] the text is approved as submitted by the applicant.

   [ ] the text has been established by this Authority to read as follows:

5. With regard to the **abstract,**

   [ ] the text is approved as submitted by the applicant.

   [X] the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No. 2

   [X] as suggested by the applicant.

   [ ] because the applicant failed to suggest a figure.

   [ ] because this figure better characterizes the invention.

   [ ] None of the figures.

Box III TEXT OF THE ABSTRACT (Continuation of item 5 of the first sheet)

A radiation source (30) is provided comprising a first active layer (42) coupled to a second active layer (62), wherein the first active layer (42) produces primary radiation of frequency nu1 by appropriate stimulation, and the primary radiation is converted by the second active layer (62) to secondary radiation of frequency nu2 for subsequent output. The coupling between the first and second active layers is achieved by an intermediary layer (58) disposed between the first active layer (42) and the second active layer (62). The radiation source (30) further comprises a p-n junction (48) incorporated in the first active layer (42), where injection of electrical carriers into the first active layer (42) from the p-n junction stimulates the first active layer (42) to emit the primary radiation.

INTERNATIONAL SEARCH REPORT

International Application No
[redacted]/EP 00/03745

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 H01L33/00 H01L25/075

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
PAJ, EPO-Internal, WPI Data, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 015, no. 412 (E-1124), 21 October 1991 (1991-10-21) & JP 03 171791 A (TOSHIBA CORP), 25 July 1991 (1991-07-25) abstract ---	1,9,11
A	SU 1 428 141 A (FIZ TEKH INST IOFFE) 10 May 1995 (1995-05-10) abstract --- -/--	1,6-8, 11,12,18

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

° Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 August 2000	29/08/2000

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL – 2280 HV Rijswijk Tel. (+31–70) 340–2040, Tx. 31 651 epo nl, Fax: (+31–70) 340–3016	De Laere, A

1

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	AIDARALIEV M ET AL: "LONG-WAVELENGTH UNCOOLED SOURCES OF LAMBDA=5-6 MU RADIATION USING GRADED-INDEX INASSB(P) LAYERS GROWN BY LIQUID-PHASE EPITAXY" TECHNICAL PHYSICS LETTERS,US,AMERICAN INSTITUTE OF PHYSICS. NEW YORK, vol. 24, no. 3, 1 March 1998 (1998-03-01), pages 243-245, XP000740639 ISSN: 1063-7850 the whole document	1,6-8, 11,12,18
A	US 4 142 196 A (DIGUET DANIEL ET AL) 27 February 1979 (1979-02-27) column 3, line 31-43	1,6-8, 11,18

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
EP 00/03745

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
JP 03171791 A	25-07-1991	NONE	
SU 1428141 A	10-05-1995	NONE	
US 4142196 A	27-02-1979	FR 2317774 A	04-02-1977
		CA 1075353 A	08-04-1980
		DE 2629785 A	27-01-1977
		GB 1551942 A	05-09-1979
		JP 52010090 A	26-01-1977